

CLAIMS

What is claimed is:

1. An electrical bistable device comprising:

an electrically conductive mixed layer comprising a first side and a second side, said mixed layer comprising a low conductivity material and a sufficient amount of a high conductivity material wherein said mixed layer is electrically conductive;

a first layer of low conductivity material located on said first side of said mixed layer, said first layer of low conductivity material having a first electrode side;

a second layer of low conductivity material located on said second side of said mixed layer, said second layer of low conductivity material having a second electrode side;

a first electrode attached to said first layer of low conductivity material at said first electrode side;

a second electrode attached to said second layer of low conductivity material at said second electrode side.

a first interface located on the first side of said mixed layer where said first layer of low conductivity material and said mixed layer meet, said first interface being electrically convertible between a low resistance state and a high resistance state by application of an electrical voltage between the said first electrode and the said mixed layer; and

a second interface located on the second side of said mixed layer where said second layer of low conductivity material and said mixed layer meet, said second interface being electrically convertible between a low resistance state and a high resistance state by application of an electrical voltage between the said second electrode and said mixed layer.

2. An electrical bistable device according to claim 1 wherein said low conductivity material is selected from the group consisting of organic semiconductors and organic insulators.

3. An electrical bistable device according to claim 1 wherein said high conductivity material is selected from the group consisting of metals, metal oxides, conducting polymers and organic conductors.
4. An electrical bistable device according to claim 1 wherein said electrically conductive mixed layer is formed by condensing vapors comprising said high conductivity material and said low conductivity material together to form said electrically conductive mixed layer.
5. A method for making a bistable device comprising the steps of:
 - providing a bottom electrode;
 - forming a layer of low conductivity organic material on said bottom electrode;
 - forming an electrically conductive mixed layer on said layer of low conductivity material, said electrically conductive mixed layer comprising a low conductivity material and a sufficient amount of a high conductivity material such that said mixed layer is electrically conductive and wherein an electrically bistable interface is formed between said layer of low conductivity material and said electrically conductive mixed layer;
 - forming a second layer of low conductivity material on said electrically conductive layer wherein a second electrically bistable interface is formed between said electrically conductive layer and said second layer of low conductivity material; and
 - forming a top electrode on said second layer of low conductivity material.
6. A method for making an electrical bistable device according to claim 5 wherein said low conductivity material is selected from the group consisting of organic semiconductors and organic insulators.

7. A method for making an electrical bistable device according to claim 5 wherein said high conductivity material is selected from the group consisting of metals, metal oxides, conducting polymers and organic conductors.
8. A method for making an electrical bistable device according to claim 5 wherein said electrically conductive mixed layer is formed by condensing vapors of said high conductivity material and said low conductivity material together to form said electrically conductive mixed layer.
9. A method comprising the step of applying a sufficient electrical voltage between the first and second electrodes of the bistable device according to claim 1 to convert both said first interface and said second interface between said high resistance state and said low resistance state.
10. A method comprising the step of applying a sufficient electrical voltage between the first electrode and the electrically conductive mixed layer of said electrical bistable device according to claim 1 to convert said first interface between said high resistance state and said low resistance state.
11. A method comprising the step of applying a sufficient electrical voltage between the second electrode and the electrically conductive mixed layer of said electrical bistable device according to claim 1 to convert said second interface between said high resistance state and said low resistance state.
12. A memory device comprising:
 - an electrically conductive mixed layer comprising a first side and a second side, said mixed layer comprising a low conductivity material and a sufficient amount of a high conductivity material wherein said mixed layer is electrically conductive;

a first layer of low conductivity material located on said first side of said mixed layer, said first layer of low conductivity material having a first electrode side;

a second layer of low conductivity material located on said second side of said mixed layer, said second layer of low conductivity material having a second electrode side;

a first interface located on the first side of said mixed layer where said first layer of low conductivity material and said mixed layer meet, said first interface being electrically convertible between a low resistance state and a high resistance state by application of an electrical voltage to said first interface,

a second interface located on the second side of said mixed layer where said second layer of low conductivity material and said mixed layer meet, said second interface being electrically convertible between a low resistance state and a high resistance state by application of an electrical voltage to said second interface;

a first electrode attached to said first layer of low conductivity material at said first electrode side;

a second electrode attached to said second layer of low conductivity material at said second electrode side;

a memory input element for applying a voltage to said first electrode, said second electrode and/or said electrically conductive mixed layer to convert said first interface and/or said second interfaces between said low electrical resistance state and said high electrical resistance state; and

a memory readout element which provides an indication of whether said first interface and/or said second interface is in said low electrical resistance state or said high electrical resistance state.

13. A memory device according to claim 12 wherein said low conductivity material is selected from the group consisting of organic semiconductors and organic insulators.

14. A memory device according to claim **12** wherein said high conductivity material is selected from the group consisting of metals, metal oxides, conducting polymers and organic conductors.

15. A memory device according to claim **12** wherein said electrically conductive mixed layer is formed by condensing vapors of said high conductivity and low conductivity materials together to form said electrically conductive mixed layer.

16. A method for operating a memory device according to claim **12** comprising the step of applying a sufficient electrical voltage to said memory input element to convert said first interface and/or said second interface between said high resistance state and said low resistance state.